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Analysis of structure borne transmission in a railway vehicle using Energy Flow method

Pascal Bouvet
Vibratec, 28 Chemin du Petit Bois, BP 36, 69131 Ecully Cedex, France

The Energy Flow Method (EFM) is a computationally efficient method, by which the results of a Finite Element Analysis (FEA) may be post-processed to form energy flow models. It can be used to study structure borne transmission in structures, based on modal descriptions of the structure and the internal cavity.
The EFM allows to form a Energy Influence Coefficient model (EIC) or an inverse SEA model. A first issue consists in partitioning the FE model into SEA sub-systems, with respect to the SEA assumptions (particularly the weak coupling assumptions). An automatic technique based on cluster analysis, can be used to determine an appropriate SEA sub-structuring, before calculating the Coupling Loss Factors (CLF) between mechanical subsystem. A second issue is to calculate the CLF between structural and acoustic subsystems.
This paper presents an industrial application of these techniques, for the analysis of structure borne transmission inside a tramway vehicle. The EFM technique is used to calculate the vibro-acoustic transfer of the car body of the tramway, and comparison with measurements on a vehicle are presented.